Aircrew & Flightline Tasks

24 May 2004

Developed as part of the
National Emergency Services Curriculum Project

O-2010
USE IN-FLIGHT SERVICES

CONDITIONS

You are a Mission Observer trainee and must discuss and use in-flight services.

OBJECTIVES

Discuss and use in-flight services.

TRAINING AND EVALUATION

Training Outline

1. As a Mission Observer trainee, knowing how to obtain in-flight services is very helpful. Observers may use in-flight services in order to reduce pilot workload, and being able to get this information may be very useful during emergencies.

2. *Flight Service Stations*. Provide assistance for preflight and in-flight briefings, scheduled and unscheduled weather broadcasts, and weather advisories. Selected FSSs provide transcribed weather briefings. Enroute weather information can be obtained from the Enroute Flight Advisory Service ("Flight Watch") by tuning 122.0 MHz into the radio and calling “Flight Watch.” It mainly provides actual weather and thunderstorms along your route. Additionally, Flight Watch is the focal point for rapid receipt and dissemination of pilot reports (PIREP'S). Other flight service frequencies are indicated on the sectional charts.

3. *Scheduled Weather Broadcasts*. All flight service stations having voice facilities on radio ranges (VOR) or radio beacons (NDB) broadcast weather reports and Notice to Airmen information at 15 minutes past each hour from reporting points within approximately 150 miles of the broadcast station.

4. *Automatic Terminal Information Service (ATIS)*. At many airports, the FAA dedicates one or more transmitters and frequencies to continuous taped broadcasts of weather observations, special instructions, and NOTAMS that relate to the airport or nearby navigational facilities. Broadcast weather information is about *actual* observations for the smaller, terminal area, *not* forecasts. ATIS information is updated *hourly*, but may be updated sooner if the weather, special instructions or NOTAMs change significantly. Usually, you must listen to ATIS recordings on the communication radio (the frequency for the ATIS transmission is found on the sectional chart near the airport’s name, or in a table on the reverse side of the sectional title panel).
A typical ATIS transmission may sound like this: "Atlanta Hartsfield Airport, arrival information 'November'. 2350 Zulu weather -- measured ceiling 800 overcast, 1 1/2 miles in fog and haze. Temperature 61 degrees, dew point 60 degrees, wind calm, altimeter 29.80. ILS approaches in progress to Runways 8 Left and 9 Right. Landing runways 8 Left and 9 Right. Atlanta VOR out of service. Taxiway Mike closed between taxiways Delta and Sierra. Read back all ‘hold short' instructions. Advise controller on initial contact you have information 'November'."

5. *Hazardous In-Flight Weather Advisory Service (HIWAS).* You can also receive advisories of hazardous weather on many VORs. As the HIWAS name implies, this information relates only to hazardous weather such as tornadoes, thunderstorms, or high winds. Navaids having HIWAS broadcast capability are annotated on the sectional chart. When receiving a hazardous weather report, ATC or FSS facilities initiate the taped HIWAS transmissions, and ATC then directs all aircraft to monitor HIWAS.

6. *Automated Weather Observation System (AWOS)*. At many airports, the FAA has installed Automated Weather Observation Systems. Each system consists of sensors, a computer-generated voice capability, and a transmitter. Information provided by AWOS varies depending upon the complexity of the sensors installed. Airports having AWOS are indicated on sectional charts by the letters AWOS adjacent to the airport name.

7. *Automated Surface Observation System (ASOS)*. The primary surface weather observing system in the U.S., the FAA has installed hundreds of ASOS. Each system consists of sensors, a computer-generated voice capability, and a transmitter. Information provided by ASOS varies depending upon the complexity of the sensors installed. ASOS can be heard by telephone, and so is very useful in flight planning. Information includes: wind speed, direction and gusts; visibility and cloud height; temperature and dew point; altimeter setting and density altitude.

8. *Pilot Weather Report (PIREP)*. FAA stations are required to solicit and collect PIREPs whenever ceilings are at or below 5,000 feet above the terrain, visibility is at or less than 5 miles, or thunderstorms, icing, wind shear, or turbulence is either reported or forecast. These are extremely useful reports, and all pilots are encouraged to volunteer reports of cloud tops, upper cloud layers, thunderstorms, ice, turbulence, strong winds, and other significant flight condition information. PIREP's are normally given to Flight Watch. They are then included at the beginning of scheduled weather broadcasts by FAA stations within 150 nautical miles of the area affected by potentially hazardous weather. Pilots are advised of these reports during preflight briefings by FAA and national weather service stations, and by air/ground contacts with FAA stations. PIREP's can help you avoid bad weather and warn you to be ready for potential hazards.

Additional Information

This task may be performed in conjunction with tasks O-2000, O-2001, O-2002. More detailed information on this topic is available in Chapter 4 and Attachment 2 of the MART.

Evaluation Preparation

Setup: Provide the student access to a telephone and an aircraft radio.

Brief Student: You are an Observer trainee asked to use in-flight services.

Evaluation

Performance measures	Results	
1. Demonstrate and discuss how to use the following in-flight services:		
a. Flight Service Stations and scheduled weather broadcasts.	P	F
b. Obtain an ATIS report.	P	F
c. HIWAS.	P	F
d. Obtain an AWOS and/or ASOS report.	P	F
e. Give a PIREP report (may be simulated).	P	F

Student must receive a pass on all performance measures to qualify in this task. If the individual fails any measure, show what was done wrong and how to do it correctly.

O-2013

PLOT A ROUTE ON A SECTIONAL CHART

CONDITIONS

You are an Observer trainee and must plot a simple route on a sectional chart.

OBJECTIVES

Plot a course on a sectional chart, select checkpoints along a route, and calculate how long it will take to fly the route.

TRAINING AND EVALUATION

Training Outline

1. As a Mission Observer trainee, knowing how to plot a route on a sectional chart is essential in order to assist the pilot, and help maintain situational awareness.

2. Plot the course. To determine a heading, locate the departure and destination points on the chart and lay the edge of a special protractor, or *plotter*, along a line connecting the two points. Use a marker to trace the route. Read the true course for this leg by sliding the plotter left or right until the center point, or grommet, sits on top of a line of longitude. When the course is more to the north or south, you can measure it by centering the grommet on a parallel of latitude, then reading the course from the inner scale that's closer to the grommet.

3. Distance. To determine the distance you're going to travel, lay the plotter on the route and read the distance using the scale that's printed on the plotter's straight edge: one edge measures nautical miles and the other statute miles.

4. Flight time. To determine the time it will take to fly between any two points, divide the distance (in nm) by the proposed airspeed (in knots).

5. Checkpoints. There are a number of ways you can add information to your chart that will help during the flight. Tick marks along the course line at specific intervals will help you keep track of your position during flight (situational awareness). Some individuals prefer five- or ten-nautical mile (nm) intervals for tick marks, while others prefer two- or four-nm intervals. Four-nautical mile spacing works well for aircraft that operate at approximately 120 knots. Since the 120-knot airplane travels 2 nm every minute, each 4 nm tick mark represents approximately two minutes of flight time. On the left side of the course line you have more tick marks, at five-nm intervals, but measured backward from the destination. In flight, these continuously indicate distance remaining to the destination, and you can easily translate that into the time left to your destination.

The next step in preparing the chart is to identify *checkpoints* along the course; you can use these to check your position on- or off-course, and the timing along the leg. Prominent features that will be easily seen from the air make the best checkpoints, and many like to circle them or highlight them with a marker in advance. You should select easy (large) targets such as tall towers, cities and towns, major roads and railroads, and significant topological features such as lakes and rivers. Try not to select checkpoints that are too close together. During a mission, checkpoint spacing will be controlled by the search altitude and weather conditions and visibility at the time of the flight.

Additional Information

More detailed information on this topic is available in Chapter 8 of the MART.

Evaluation Preparation

Setup: Provide the student with a sectional chart and a plotter. Give the student two points on the chart.

Brief Student: You are an Observer trainee asked to plot a course, select checkpoints along the route, and calculate time in flight.

Evaluation

Performance measures	Results	
Given a sectional chart, a plotter, and two points on the chart (e.g., two airports):		
1. Plot a course between the two points.	P	F
2. Select checkpoints along the route. Discuss the reason you selected the checkpoints.	P	F
3. Calculate the time it will take an aircraft (120 knots with no wind) to fly the route.	P	F

Student must receive a pass on all performance measures to qualify in this task. If the individual fails any measure, show what was done wrong and how to do it correctly.

O-2107

PREPARE FOR A TRIP TO A REMOTE MISSION BASE

CONDITIONS

You are a Mission Observer trainee and must prepare for a trip to a remote mission base.

OBJECTIVES

Prepare for a trip to a remote mission base, acting as mission commander. Assist in performing pre-trip planning and inspections, preflight tasks and briefings, filling out a CAP flight plan, and after-landing tasks.

TRAINING AND EVALUATION

Training Outline

1. As a Mission Observer trainee, the ability to prepare for a trip to a remote mission base is essential.

2. *Before you leave*. The urgency of events, coupled with a hasty call-out, may leave you and other crewmembers feeling rushed as you prepare to leave for a mission. This is where a good pre-mission checklist comes in handy. As a minimum, check the crew (and yourself) for the following:

A. Proper uniforms (CAPM 39-1) and credentials
   1) CAP Membership
   2) CAP Motor Vehicle Operator
   3) ROA
   4) 101/101T (note experience and tasks to be accomplished)
   5) Ensure the pilot has necessary credentials (e.g., license, medical, and photo ID)

B. Check personal equipment
   1) Clothing sufficient and suitable for the entire trip
   2) Personal supplies (civilian clothing, headset, charts, maps, plotter, log, checklists, fluids and snacks)
   3) Personal survival equipment (in addition to the aircraft kit) suitable for the entire trip
   4) Sufficient money for the trip (credit cards, some cash or traveler's checks, and coin)
   5) Cell phone (including spare battery and charger)

C. Check aircraft equipment
   1) Current aeronautical charts for the entire trip, and gridded charts for the mission area
   2) Maps for the mission area (e.g., road atlas, county maps, topo maps), plus clipboard and markers
   3) Tie-downs, chocks, Pitot tube cover and engine plugs, fuel tester, sick sacks, and cleaning gear
   4) Survival kit (fits trip and mission area terrain), headsets, flashlight, binoculars and multitool

D. Ensure the pilot reviews the Aircraft Logs
   1) Note the date and the starting Tach and Hobbs times to ensure you won't exceed:
      a) Mid-cycle oil change (40-60 hours, not to exceed four months)
      b) 100-hour/Annual
      c) 24-month checks (Transponder, Pitot-Static system, Altimeter and ELT/battery replacement date
      d) 30-day VOR check for IFR flight and AD compliance list.
   2) Check the status of the Carbon Monoxide Detector and Fire Extinguisher
   3) Pilot reviews the Discrepancy Log and makes sure the aircraft is airworthy and mission ready

E. Pilot obtains FAA Weather Briefing and CAP Flight Release
   1) Perform Weight & Balance (reflecting weights for the crew, special equipment and baggage)
      a) Include fuel assumptions (fuel burn, winds, power setting, distance, and fuel stop)
      b) Ensure fuel reserve (land with one hour's fuel, computed at normal cruise)
   2) Verify within flight time and duty limitations (CAPR 60-1, Chapter 2)
   3) Obtain FAA briefing (ask for FDC and Local NOTAMs and SUA status) and file FAA Flight Plan

        a) Enter 'CPF XXXX' in the Aircraft Identification section
        b) Put the 'N' and 'Cap Flight' numbers in the Remarks section
    4) Assist in filling out an "Inbound" CAPF 104 or 84 (leave copy for FRO)
    5) Pilot briefs the crew on the fuel management plan (assumptions, refueling stops, and reserve), Local and FDC NOTAMs, and SUA status
    6) Review "IMSAFE" and pilot obtains a CAP Flight Release
    7) Pilot requests Flight Following

F. Pilot preflight
    1) Ensure proper entries in the Flight Log (e.g., mission number & symbol, crew & FRO names)
    2) Check starting Tach and Hobbs times to ensure you won't exceed limits (e.g., oil change)
    3) Review the Discrepancy Log and make sure the aircraft is airworthy and mission ready
    4) While preflighting, verify any outstanding discrepancies. If new discrepancies discovered, log them and ensure the aircraft is still airworthy and mission ready. [Be extra thorough on unfamiliar aircraft.]
    5) Verify load is per your Weight & Balance (baggage, survival kit, extra equipment and luggage)
    6) Double-check aeronautical charts, maps and gridded charts (also clipboard and markers)
    7) Ensure required aids onboard (Flight Guide, distress and air-to-ground signals, fuel tester, tools)
    8) Windshield and windows clean, and chocks, tie-downs, Pitot tube covers and engine plugs stowed
    9) Right Window holding screw removed (video imaging mission) and stored
    10) Check and test special equipment (cameras, camcorder, slow-scan, repeater), including spare batteries
    11) Parking area clear of obstacles (arrange for a wing-walker if one will be needed to clear obstacles)
    12) Perform passenger briefing and review emergency egress procedure
    13) Review taxi plan/diagram and brief crew assignments for taxi, takeoff and departure
    14) Remind crew that most midair collisions occur in or near the traffic pattern
    15) Enter settings into GPS (e.g., destination or flight plan)
    16) Organize the cockpit

G. Startup and Taxi
    1) Pilot briefs checklist method to be used (e.g., challenge-response)
    2) Seat belts at all times; shoulder harness at or below 1000' AGL
    3) Double-check Intercom, Audio Panel and Comm Radio settings
    4) Rotating Beacon Switch ON and pilot signals marshaller before starting engine; lean for taxi
    5) Ensure DF and FM Radio are operable and set properly (FM radio check if first flight)
    6) Select initial VOR radial(s) and GPS setting
    7) Obtain ATIS and Clearance (read back all clearances and hold-short instructions)
    8) Pilot computes crosswind and verify within Crosswind Limitation
    9) Verify 3 statute miles visibility (VFR in Class G - unless PIC is current IFR)
    10) If IFR, verify weather at or above landing minimums and date of last VOR check
    11) Begin sterile cockpit
    12) Pilot signals marshaller before taxiing; checks brakes at beginning of roll
    13) Pilot taxis no faster than a slow walk when within 10 feet of obstacles
        a) Maintains at least 50' behind light single-engine aircraft
        b) Maintains at least 100' behind small multi-engine and jet aircraft
        c) Maintains at least 500' behind heavies and taxiing helicopters

H. Takeoff, Climb and Departure
    1) Pilot double-checks assigned departure heading and altitude
    2) Pilot leans engine for full power (> 3000' DA)
    3) Look for landing traffic before taking the active runway
    4) Keep lights on within 10 miles of the airport and when birds reported nearby
    5) Begin Observer Log with takeoff (time and Hobbs) and report "Wheels Up"
    6) Pilot uses shallow S-turns and lifts wing before turns during climbing to check for traffic
    7) Keep shoulder harnesses buckled (never remove at or below 1000' AGL)
    8) Keep crew apprised of conflicting aircraft and obstacle positions

9) Keep checklists close at hand and open to Emergency Procedures

I Enroute

1) Maintain situational awareness
2) Pilot leans engine for economy cruise
3) Ensure pilot updates fuel assumptions and sets altimeter to closest source at least hourly

J Approach, Descent and Landing

1) Pilot plans approach and descent (remembers fuel mixture and cooling)
2) Double-checks radio and navigational settings
3) Obtain ATIS/AWOS and contact approach control
4) Review taxi plan/diagram and brief crew assignments for approach, landing and taxi
5) Remind crew that most midair collisions occur in or near the traffic pattern, especially on final
6) Begin sterile cockpit
7) Turn lights on within 10 miles of the airport
8) Pilot double-checks assigned approach heading and altitude
9) Pilot uses shallow S-turns and lifts wing before turns during descent to check for traffic
10) Read back all clearances and hold-short instructions
11) Log (time and Hobbs) and report "Wheels Down"

3. *Arrival at mission base*

A. Park and Secure Aircraft

1) Look for marshallers, follow taxi plan, pilot signals marshaller that ignition is OFF
2) Double-check Master Switch OFF
3) Fuel Selector Switch to Right or Left (refueling)
4) Avionics/control Lock and Pitot tube covers/engine plugs installed
5) Pilot completes the Flight Log and enters squawks in Discrepancy Log
6) Chocks and Tie-downs installed and Parking Brake OFF
7) Remove trash and personal supplies/equipment
8) Lock the windows, doors and baggage compartment
9) Check oil and arrange for refueling
10) Clean leading edges, windshield, and windows
11) Replenish cleaning kit

B. Check in with Flight Line Supervisor and Safety Officer

C. Close FAA Flight Plan, call FRO

D. Sign personnel and aircraft into the mission (Administration)

E. Assist in completing and submitting 'Inbound 104' (keep a copy)

F. Report any special equipment to Logistics (cameras, camcorder, slow-scan, repeater)

G. Inquire about fuel billing, lodging, transportation and meals

H. Note time to report for duty and ask for sortie assignment (get briefing packet)

The mission staff will probably show you around mission base and inform you of transportation, lodging and meal arrangements. They will also tell you when to report for duty, normally by telling you when the general briefing will be held.

Additional Information

More detailed information and figures on this topic are available in Chapter 13 and Attachment 2 of the MART.

Practice

Setup: Give the student an assignment to go to a remote mission base. The base should be located on a large (unfamiliar) airport in controlled airspace -- Class B, if practical. The student should have access to mission materials and a CAPF 104.

The student will assist in planning a simulated a trip to a remote mission base. All tasks that can be performed will not be simulated.

The trainer should play the role of the mission pilot, particularly for performing inspections and giving briefings and instructions to the observer trainee. The observer will be given preflight and pilot briefings.

For this simulated sortie, watch for:

1) Thorough knowledge of documents and equipment required for an extended stay at a remote base.

2) Assists pilot in completion of the CAP flight plan.

3) Assists pilot with accurate and thorough planning for the trip.

4) Proper actions upon arrival at mission base.

Evaluation Preparation

Setup: Give the student an assignment to go to a remote mission base. The base should be located on a large (unfamiliar) airport in controlled airspace -- Class B, if practical. The student should have access to mission materials and a CAPF 104.

The student will assist in planning a simulated a trip to a remote mission base. All tasks that can be performed will not be simulated.

The trainer should play the role of the mission pilot, particularly for performing inspections and giving briefings and instructions to the observer trainee. The observer will be given preflight and pilot briefings.

Brief Student: You are a Mission Observer trainee asked to prepare for a trip to a remote mission base.

Evaluation

Performance measures	Results	
1. Check for proper uniform, credentials and equipment.	P	F
2. State the flight time and duty limitations per CAPR 60-1.	P	F
3. Assist in checking the aircraft:		
a. Check for required equipment on board (e.g., tie downs, survival kit, cleaning gear).	P	F
b. Clean windows, as necessary.	P	F
4. Assist in filling out a CAP flight plan.	P	F
5. Receive a briefing from the mission pilot:		
a. Fuel assumptions and fuel stop.	P	F
b. Airspace restrictions, NOTAMS, and destination airport diagrams.	P	F
6. Upon (simulated) arrival at mission base:		

a. Secure the aircraft and arrange for refueling.	P	F
b. Sign yourself and the aircraft into the mission.	P	F
c. Assist in completing your "Inbound" CAPF 104.	P	F

Student must receive a pass on all performance measures to qualify in this task. If the individual fails any measure, show what was done wrong and how to do it correctly.

P-2007
<u>DISCUSS MISSION OBSERVER DUTIES AND RESPONSIBILITIES</u>

CONDITIONS

You are a Mission Observer trainee and must discuss observer duties and responsibilities.

OBJECTIVES

Discuss Observer duties and responsibilities.

TRAINING AND EVALUATION

Training Outline

1. As a Mission Observer trainee, understanding your duties and responsibilities is essential. The mission observer has a key role in CAP missions, and has expanded duties that mainly pertain to assisting the mission pilot. This assistance may be in the planning phase, handling radio communications, assisting in navigation, and crew management (i.e., mission commander). The proficient observer makes it possible for the pilot to perform his duties with a greater degree of accuracy and safety by assuming these aspects of the workload.

2. The Observer's primary role while actually in a search area is that of scanner.

3. General duties and responsibilities include:

   a. Depending on conditions, you may report with the mission pilot for briefing. Wear appropriate clothes for a mission.
   b. Assist in planning the mission. The observer may act as mission commander for the sortie.
   c. Assist in avoiding collisions and obstacles during taxiing.
   d. Assist in setting up and operating aircraft and CAP radios.
   e. Assist in setting up and operating aircraft navigational equipment (e.g., VORs and GPS).
   f. Assist enforcing the sterile cockpit rules.
   g. Maintain situational awareness at all times.
   h. Assist in monitoring fuel status.
   i. Monitor the electronic search devices aboard the aircraft and advise the pilot when making course corrections in response to ELT signals.
   j. Keep mission base and/or high bird appraised of status.
   k. Coordinate scanner assignments and ensure proper breaks for the scanners (including yourself). Monitor crew for fatigue and dehydration (ensure the crew drinks plenty of fluids).
   l. Maintain a chronological flight log of all observations of note, including precise locations, sketches and any other noteworthy information.
   m. Depending on conditions, report with the mission pilot for debriefing immediately upon return to mission base. The applicable portions on the reverse of CAPF 104 should be completed prior to debrief.
   n. Keep track of assigned supplies and equipment.

4. Once team members have been briefed on the mission and accomplished the necessary planning, observers determine that all necessary equipment is aboard the airplane. Checklists help ensure that all essential equipment is included, and vary according to geographic location, climate, and terrain of the search area. Items on the observer's checklist should include CAP membership and specialty qualification cards, current charts and maps of the search area, flashlights, notebook and pencils, binoculars, and survival gear (prohibited items, such as firearms, should be listed too, to ensure none is included). A camera may be included to assist in describing the location and condition of the search objective or survivors. Unnecessary items or personal belongings

should be left behind. The mission observer also assists the pilot in ensuring that all equipment aboard the search aircraft is properly stowed. An unsecured item can injure the crew or damage the aircraft in turbulence.

5. Once airborne, the observer provides navigation and communication assistance, allowing the pilot to precisely fly the aircraft with a greater degree of safety. The observer also assists in enforcing "sterile cockpit" rules when necessary. In flight, particularly the transit phase, the observer maintains situational awareness in order to help ensure crew safety.

6. The mission observer divides and assigns scanning responsibilities during her mission observer briefing, and ensures each scanner performs their assigned duty during flight. She monitors the duration of scanner activity, and enables the scanners to rest in order to minimize fatigue.

7. Observer Log. The observer must become proficient in using an in-flight navigational log. A complete chronological log should be maintained from take-off until landing, and should include all events and sightings. Skill in maintaining the log requires training and experience. Remember, *proficiency and confidence are gained through practice and application*. It is important to log the geographical location of the search aircraft at the time of all events and sightings (as a habit, always log the Hobbs time each time you make a report or record an event or sighting). This information is the basis of CAP Form 104, which is passed back to the incident commander and general staff after the debriefing and becomes a part of the total information that is the basis for his subsequent actions and reports. Good logs give the staff a better picture of how the mission is progressing. If sketches or maps are made to compliment a sighting, note this and attach them to the log. The log and all maps and sketches will be attached to the CAPF 104.

Additional Information

More detailed information on this topic is available in CAPR 60-1 and in Chapter 1 of the Mission Aircrew Reference Text (MART).

Evaluation Preparation

Setup: Provide the student with a current copy of CAPR 60-1 and the MART.

Brief Student: You are an Observer trainee asked about your duties and responsibilities, and to discuss the Observer's job and log.

Evaluation

Performance measures	Results	
1. State the primary role of the observer, particularly when in the search area.	P	F
2. Discuss general duties and responsibilities.	P	F
3. Discuss pre-flight duties and responsibilities.	P	F
4. Discuss in-flight duties and responsibilities.	P	F
5. Discuss post-flight duties and responsibilities.	P	F
6. Discuss what should be entered into the observer log.	P	F

Student must receive a pass on all performance measures to qualify in this task. If the individual fails any measure, show what was done wrong and how to do it correctly.

P-2008
<u>DISCUSS THE DANGERS OF ICING</u>

CONDITIONS

You are a Mission Observer trainee and must discuss how icing occurs and associated dangers.

OBJECTIVES

Discuss how airframe and carburetor icing occur and their affects on aircraft performance.

TRAINING AND EVALUATION

Training Outline

1. As a Mission Observer trainee, knowing how icing forms and affects the aircraft is essential.

2. *Frost*. When the ground cools at night, the temperature of the air immediately adjacent to the ground is frequently lowered to the saturation point, causing condensation. This condensation takes place directly upon objects on the ground as dew if the temperature is above freezing, or as frost if the temperature is below freezing. Dew is of no importance to aircraft, but frost can be deadly. Normally we think of frost as unimportant - it forms on cars or other cold surfaces overnight, soon melting after the sun rises. However, frost on an airplane disturbs the airflow enough to reduce the lift and efficiency of aerodynamic surfaces. An airplane *may* be able to fly with frost on its wings, but, even with the airflow over the wings only slightly disrupted, controllability can become unpredictable. *Frost should always be removed before flight*. Some precautions should be taken if frost is expected, such as placing the aircraft in a hanger (even a T-hanger).

3. *Airframe icing*. There are only two fundamental requisites for ice formation on an aircraft in flight: first the aircraft must be flying through visible water in the form of rain or cloud droplet, and second, when the liquid water droplets strike, their temperature or the temperature of the airfoil surface, must be 32º F. or below. Ice increases drag and decreases lift: an ice deposit of as little as one-half inch on the leading edge of a wing can reduce lift by about 50%, increase drag by an equal percentage, and thus greatly increase the stall speed. Ice deposits also increase weight (on a typical C172 a quarter-inch coating of ice can add up to 150 lbs., a half-inch can add 300 lbs., and an inch of clear ice can add 600 lbs.). Additionally, propeller efficiency is decreased.

Sorties should never be flown in regions of possible icing. As altitude increases, temperature decreases at a fairly uniform rate of 2° Celsius or 3.6° Fahrenheit for each 1000 feet. This rate of temperature change is known as the *lapse rate*. At some altitude, the air temperature reaches the freezing temperature of water, and that altitude is known as the *freezing level*. You can estimate the freezing level prior to flight by using simple mathematics. For example, if the airport elevation is 1,000 feet and the temperature at ground level is 12° Celsius, the freezing level would be at approximately 6,000 feet above ground level (AGL) or 7,000 feet above mean sea level (MSL). Since the lapse rate is 2° per thousand feet, it would take 6,000 feet of altitude to go from 12° Celsius to 0°, the freezing temperature of water. The same technique works for Fahrenheit, but you use 3.6° for the lapse rate. Don't forget to include the airport elevation in your computations -- altimeters are normally set to display MSL rather than AGL altitude. [This method yields a very approximate value for the freezing level. You are encouraged to leave a wide margin for error above and below this altitude if you must fly through visible moisture during a search.]

4. *Carburetor icing*. Unlike aircraft structural icing, carburetor ice can form on a warm day in moist air. In the winter when temperatures are below 40º F. the air is usually too cold to contain enough moisture for carburetor ice to form. In the summer when temperatures are above 85º F. there is too much heat for ice to form. So, airplanes are most vulnerable to carburetor icing when operated in high humidity or visible moisture with

temperatures between 45º and 85º F. It's most likely to become a problem when the aircraft is operated at low power settings, such as in descents and approaches to landings.

5. Taxiing in snow and ice can be dangerous. The pilot should never attempt to taxi through snow banks, and should be very deliberate and careful while taxiing on snow or ice. Run-ups should be conducted in an area free of snow or ice, if possible. The observer (and scanner) must assist the pilot in these conditions, and be especially watchful for runway and taxiway boundaries and other obstacles that may be obscured by snow or ice.

Additional Information

More detailed information on this topic is available in Chapter 6 of the MART.

Evaluation Preparation

Setup: None.

Brief Student: You are an Observer trainee asked to discuss icing.

Evaluation

Performance measures	Results	
1. Discuss the following concerning icing:		
a. Freezing level.	P	F
b. How airframe frost and icing affects aircraft performance.	P	F
c. How carburetor icing affects aircraft performance.	P	F

Student must receive a pass on all performance measures to qualify in this task. If the individual fails any measure, show what was done wrong and how to do it correctly.

P-2009
<u>DISCUSS THE DANGERS OF REDUCED VISIBILITY CONDITIONS</u>

CONDITIONS

You are a Mission Observer trainee and must discuss the causes and dangers of reduced visibility.

OBJECTIVES

Discuss the causes and dangers of reduced visibility and their effect on search operations.

TRAINING AND EVALUATION

Training Outline

1. As a Mission Observer trainee, basic knowledge of how reduced visibility conditions affect search operations.

2. Reduced visibility conditions. One of the most common hazardous weather problems is loss of visibility. This can happen either suddenly or very insidiously, depriving the pilot of his ability to see and avoid other aircraft, and reducing or depriving him altogether of his ability to control the aircraft, unless he has had training and is proficient in instrument flying. In reduced visibility, the crew's ability to see rising terrain and to avoid towers, power transmission lines, and other man-made obstacles is diminished. Visibility may be reduced by many conditions including clouds, rain, snow, fog, haze, smoke, blowing dust, sand, and snow. A similar condition called “white out” can occur where there has been snowfall.

Fog, especially dense fog, can make it extremely difficult, if not impossible, to see landing runways or areas. The crew should be alert for a potential problem with fog whenever the air is relatively still, the temperature and dew point are within several degrees, and the temperature is expected to drop further, as around sunset and shortly after sunrise. This is often a factor in delaying the first sorties of the day.

Haze, a fine, smoke-like dust causes lack of transparency in the air. It's most often caused when still air prevents normal atmospheric mixing, allowing the particles to persist, instead of the wind's dispersing them. Like fog, it is most likely to occur when the air is still. When haze and smoke are present, the best measure a flight crew can take to minimize risk of such an encounter is to get a thorough weather briefing before flying, and update the briefing by radio with *Flight Watch* as required.

3. Effects. According to FAA regulations, under almost all circumstances flight using visual flight rules can only be conducted with at least three miles of visibility. If clouds cover more than one-half the sky, the cloud bases must be no lower than 1,000 feet above the terrain. In addition, search aircraft must usually remain at least 500 feet below the cloud deck.

Each member of the aircrew must be vigilant during all phases of the flight when visibility is less than perfect. Crew resource management requires that each member of the crew be assigned an area to search during the takeoff, transit and approach-to-landing phases of the flight in order to help the pilot "see and avoid" obstacles and other aircraft. The aircrew must also characterize visibility in the search area so as to establish the proper scanning range: search visibility may be different than expected, and your search pattern may have to be adjusted accordingly. Be sure to cover this during your debriefing.

Additional Information

More detailed information on this topic is available in Chapter 6 of the MART and Attachment 2 of the MART.

Evaluation Preparation

Setup: None.

Brief Student: You are an Observer trainee asked to discuss reduced visibility conditions and their affect on search operations.

Evaluation

Performance measures	Results	
1. Discuss the following concerning reduced visibility conditions:		
a. Reduced visibility conditions.	P	F
b. Basic reduced visibility minimums.	P	F
c. Effects on search operations.	P	F

Student must receive a pass on all performance measures to qualify in this task. If the individual fails any measure, show what was done wrong and how to do it correctly.

P-2010
DISCUSS THE DANGERS OF WIND AND THUNDERSTORMS

CONDITIONS

You are a Mission Observer trainee and must discuss effects and dangers of wind and thunderstorms.

OBJECTIVES

Discuss effects and dangers of wind and thunderstorms.

TRAINING AND EVALUATION

Training Outline

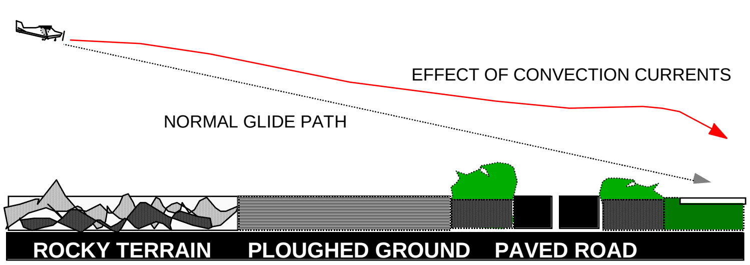
1. As a Mission Observer trainee, knowing the effects and dangers of winds and thunderstorms is essential.

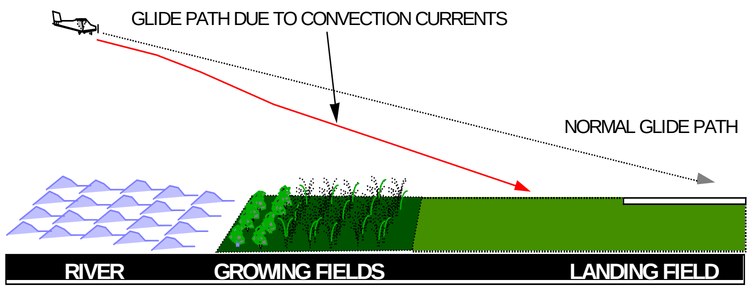
2. Winds around pressure systems. Certain wind patterns can be associated with areas of high and low pressure: air flows from an area of high pressure to an area of low pressure. In the Northern Hemisphere during this flow the air is deflected to the right because of the rotation of the earth. Therefore, as the air leaves the high-pressure area, it is deflected to produce a clockwise circulation. As the air flows toward a low-pressure area, it is deflected to produce a counterclockwise flow around the low-pressure area.

Another important aspect is air moving out of a high-pressure area depletes the quantity of air. Therefore, highs are areas of descending air. Descending air favors dissipation of cloudiness; hence the association that high pressure usually portends good weather. By similar reasoning, when air converges into a low-pressure area, it cannot go outward against the pressure gradient, nor can it go downward into the ground; it must go upward. Rising air is conducive to cloudiness and precipitation; thus the general association low pressure — bad weather.

3. Convection currents. Certain kinds of surfaces are more effective than others at heating the air directly above them. Plowed ground, sand, rocks, and barren land give off a great deal of heat, whereas water and vegetation tend to absorb and retain heat. The uneven heating of the air causes small local circulation called "convection currents", which are similar to the general circulation just described. Convection currents cause the bumpiness experienced by aircrews flying at low altitudes in warmer weather. On a low flight over varying surfaces, the crew will encounter updrafts over pavement or barren places and down drafts over vegetation or water. Ordinarily this can be avoided by flight at higher altitudes, so aircrews may need to climb periodically to take a break from the rough air at search altitudes.

Convection currents also cause difficulty in making landings, since they affect the rate of descent. The figures below show what happens to an aircraft on a landing approach over two different terrain types. The pilot must constantly correct for these affects during the final approach to the airport.





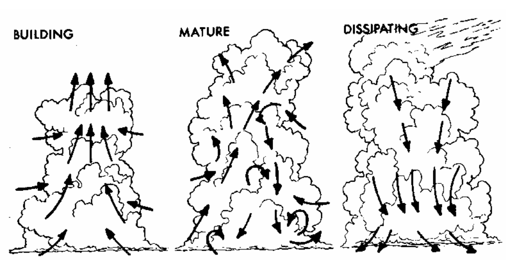
4. Cold and warm fronts. Certain characteristics of frontal activities will affect search effectiveness (primarily visibility and turbulence). For the aircrew, these factors must be considered during mission planning.

Characteristics of a cold, unstable air mass are:
Cumulus and cumulonimbus clouds
Unlimited ceilings (except during precipitation)
Excellent visibility (except during precipitation)
Unstable air resulting in pronounced turbulence in lower levels (because of convention currents)
Occasional local thunderstorms or showers - hail sleet, snow flurries

Characteristics of a warm, stable air mass are:
Stratus and stratocumulus clouds
Generally low ceilings
Poor visibility (fog, haze, smoke, and dust held in lower levels)
Smooth, stable air with little or no turbulence
Slow steady precipitation or drizzle

5. Windshear. Windshear is best described as a change in wind direction and/or speed within a very short distance in the atmosphere. Under certain conditions, the atmosphere is capable of producing some dramatic shears very close to the ground; for example, wind direction changes of 180º and speed changes of 50 knots or more within 200 ft. of the ground have been observed. This, however, is unusual. Turbulence may or may not exist in wind shear conditions. If the surface wind under the front is strong and gusty there will be some turbulence associated with wind shear.

6. Thunderstorms. A thunderstorm is any storm accompanied by thunder and lighting. It usually includes some form of precipitation, and can cause trouble for aircraft in many forms: turbulence, icing, poor visibility, hail, wind shear, microbursts, lightning, and, in severe cases, tornadoes. No thunderstorm should ever be taken lightly. During the cumulus stage, vertical growth occurs so quickly that climbing over the developing thunderstorm is not possible. Flight beneath a thunderstorm, especially in the mature stage, is considered very foolish, due to the violent down drafts and turbulence beneath them. Flight around them may be a possibility, but can still be dangerous. Even though the aircraft may be in clear air, it may encounter hail, lightning, or turbulence a significant distance from the storm's core. *Thunderstorms should be avoided by at least 20 miles laterally*. The safest alternative, when confronted by thunderstorms, is to land, tie the aircraft down, and wait for the storms to dissipate or move on.



Additional Information

More detailed information on this topic is available in Chapter 6 of the MART.

Evaluation Preparation

Setup: None.

Brief Student: You are an Observer trainee asked to discuss the dangers of winds and thunderstorms.

Evaluation

Performance measures	Results	
1. Discuss the effects of convection currents, particularly during landing.	P	F
2. Discuss wind patterns around high- and low-pressure areas.	P	F
3. Discuss the characteristics of cold and warm fronts.	P	F
4. Discuss the dangers of windshear.	P	F
5. Discuss the dangers of thunderstorms.	P	F

Student must receive a pass on all performance measures to qualify in this task. If the individual fails any measure, show what was done wrong and how to do it correctly.

P-2011
DISCUSS THE EFFECTS OF DENSITY ALTITUDE ON AIRCRAFT PERFORMANCE

CONDITIONS

You are a Mission Observer trainee and must discuss how density altitude affects aircraft performance.

OBJECTIVES

Describe the factors that are used to determine density altitude, and discuss the effect of high density altitude on aircraft performance and strategies to deal with high density altitudes during search operations.

TRAINING AND EVALUATION

Training Outline

1. As a Mission Observer trainee, knowing how density altitude affects aircraft performance is very helpful.

2. *Atmospheric pressure*. Pressure at a given point is a measure of the weight of the column of air above that point. As altitude increases, pressure diminishes as the weight of the air column decreases. This decrease in pressure has a pronounced effect on flight. The aircraft's altimeter is sensitive to these changes in pressure, and displays this pressure as altitude. When the altimeter is set to the current reported altimeter setting it indicates the aircraft's height above mean sea level (MSL). [If a local altimeter setting is unavailable, pilots usually set the altimeter to indicate the airport's MSL elevation.]

Changes in pressure are registered in inches of mercury: the *standard* sea-level pressure is 29.92 inches at a *standard* temperature of 15º C (59º F). If CAP aircraft always operated at standard conditions, the altimeter would always be accurate. An aircraft with an indicated (on the altimeter) altitude of 5,000' MSL will really be 5000' above the ground (AGL). However, these standard conditions rarely exist because the density of the atmosphere is always changing as altitude and temperature changes. [The third factor - humidity - also effects density, but the effect is smaller and its very hard to determine.]

3. *Pressure altitude*. Pressure altitude is an altitude measured from the point at which an atmospheric pressure of 29.92 inches of mercury is found. A good rule of thumb is that a 1,000' change of altitude results in a 1-inch (mercury) change on a barometer. Another way to determine pressure altitude is to enter 29.92 into the altimeter's window and read the resulting altitude indication.

4. *Density altitude*. When pressure altitude is corrected for non-standard temperature, *density altitude* can be determined.

5. *Effects*. The combined effects of high altitude and temperature (high density altitude) can have a significant effect on performance of aircraft engines, wings, propellers, and the pilot and crew. If all missions were conducted on cool, low humidity days along the Gulf coast there would be no concern with air density and its implications on flight safety. Obviously, this isn't the case. In fact, these conditions have often been primary factors in aircraft accidents, and may result in loss of the search aircraft, unless you pay careful attention.

The most noticeable effect of a decrease in pressure (increase in density altitude) due to an altitude increase becomes evident during takeoff, climb, and landing. An airplane that requires a 1,000' run for takeoff at a sea-level airport will require a run almost twice as long at an airport that is approximately 5,000' above sea level. The purpose of the takeoff run is to gain enough speed to generate lift from the passage of air over the wings. If the air is thin, more speed is required to obtain enough lift for takeoff- hence, a longer ground run. It is also true that the engine is less efficient in thin air, and the thrust of the propeller is less effective. The rate of climb is also slower at the higher elevation, requiring a greater distance to gain the altitude to clear any obstructions. In landing, the difference is not so noticeable except that the plane has greater groundspeed when it touches the ground.

6. *Strategies*. The mission staff can make a number of decisions to help minimize the effects of high density altitude operations and thus maximize flight safety. If aircraft having turbo-charged or super-charged engines are available, the incident commander may assign their crews that part of the search over the high terrain. Supercharging or turbocharging regains some of the engine performance lost with the decrease in air density, but cannot improve upon that lost from the wings or propeller.

Incident commanders may schedule flights to avoid searching areas of high elevation during the hottest times of the day. This is a tradeoff though, in that the best sun angles for good visibility often coincide with the hot times of the day. The incident commander may also elect to limit crew size to minimize airplane total weight. Instead of dispatching a four-seat aircraft with a pilot, observer, and two scanners aboard, he may elect to send a pilot, observer and single scanner only. Again, this represents a tradeoff, where some search capability is sacrificed for a higher margin of safety.

The pilot may decide to takeoff on a mission with only the fuel required for that mission and the required reserve, rather than departing with full fuel tanks. Each crewmember can help by leaving all *nonessential* equipment or personal possessions behind. In areas of high density altitude, airplane performance can be improved significantly by simply leaving nonessential, excess weight behind.

To help remember these conditions and their effects, an observer should remember the four "H's." *Higher Humidity, Heat, or Height all result in reduced aircraft performance*. Available engine power is reduced, climb capability is reduced, and takeoff and landing distances are increased.

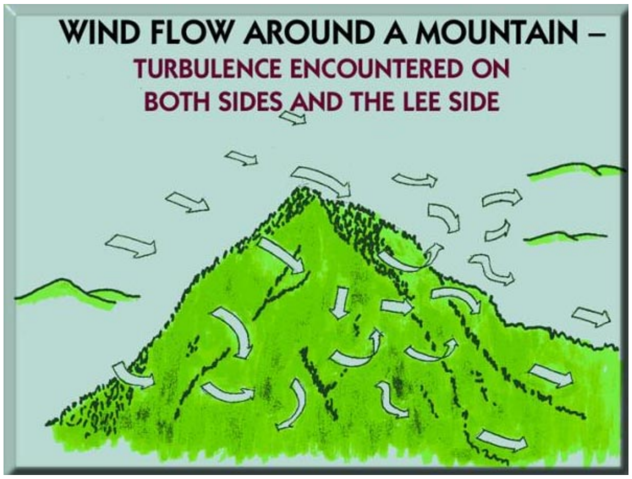
7. *Mountainous terrain*. Aircrews flying the mountains must complete a course such as *Mountain Fury*.

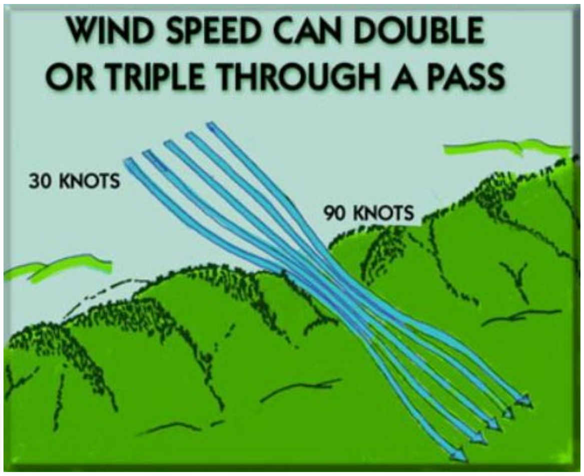
When flying in mountainous areas it is recommended that flights be planned for early morning or late afternoon because heavy turbulence is often encountered in the afternoon, especially during summer. In addition, flying at the coolest part of the day reduces density altitude. Attempt to fly with as little weight as possible, but don't sacrifice fuel; in the event of adverse weather, the additional reserve could be a lifesaver.

Study sectionals for altitudes required over the route and for obvious checkpoints. Prominent peaks make excellent checkpoints, as do rivers and passes. Be aware that mountain ranges have many peaks that may look the same to the untrained eye, so continually crosscheck your position with other landmarks and radio aids if possible. Also, the minimum altitude at which many radio aids are usable will be higher in the mountains. For that reason, low-frequency navigation, such as ADF, LORAN, or GPS tend to work best in the mountains.

A weather check is essential for mountain flying. Ask specifically about winds aloft even when the weather is good. Expect winds above 10,000 feet to be prevailing westerlies in the mountain states. If winds aloft at your proposed altitude are above 30 knots, do not fly. Winds will be of much greater velocity in passes, and it will be more turbulent as well. Do not fly closer than necessary to terrain such as cliffs or rugged areas. Dangerous turbulence may be expected, especially when there are high winds (see figures, below).

Crews must be constantly careful that a search never takes them over terrain that rises faster than the airplane can climb. Narrow valleys or canyons that have rising floors must be avoided, unless the aircraft can be flown from the end of higher elevation to the lower end, or the pilot is *certain* that the aircraft can climb faster than the terrain rises. Careful chart study by the crew prior to flight will help identify this dangerous terrain.





Additional Information

More detailed information on this topic is available in Chapter 7 of the MART.

Evaluation Preparation

Setup: Provide the student with charts and/or a flight computer to compute density altitude.

Brief Student: You are an Observer trainee asked to calculate density altitude and discuss its effects.

Evaluation

Performance measures	Results	
1. Discuss atmospheric pressure, pressure altitude and density altitude.	P	F
2. Obtain the local altimeter setting and enter it into an aircraft altimeter.	P	F
3. Discuss how high density altitude degrades aircraft performance.	P	F
4. Discuss strategies to deal with high density altitude on search operations.	P	F
5. Discuss mountainous terrain precautions and strategies.	P	F

Student must receive a pass on all performance measures to qualify in this task. If the individual fails any measure, show what was done wrong and how to do it correctly.

P-2012

IDENTIFY CONTROLLED AND SPECIAL USE AIRSPACES ON A SECTIONAL

CONDITIONS

You are a Mission Observer trainee and must identify controlled and special use airspaces on a sectional chart.

OBJECTIVES

Identify controlled and special use airspaces on a sectional chart and discuss operations in or near each.

TRAINING AND EVALUATION

Training Outline

1. As a Mission Observer trainee, being able to identify and discuss operations near controlled airports and special use airspaces is essential.

2. Controlled airports. The most stringent requirements normally are associated with flight in airspace immediately surrounding a major airport due to the high density of operations conducted there. Observers must be alert for required communication when it appears a search will be conducted within 40 miles of a major airport or within 5 miles of any airport having an operating control tower: these are color coded *blue* on sectional charts. Major airports in this context are generally near major metropolitan areas and appear at or near the center of concentric blue-, magenta-, or gray-colored circles. Also, crew resource management and the "sterile cockpit" environment are essential in or near these busy airports in order to "see and avoid" obstacles and other aircraft.

3. Special Use Airspace. Although not a class of airspace, the FAA has designated some airspace as "special use" airspace. The FAA has specifically created special use airspace for use by the military, although the FAA retains control. Active special use airspace can become a navigational obstacle to search aircraft and uncontrolled objects (e.g., missiles) within the airspace can present a serious threat to the safety of CAP aircraft and personnel. Special use airspace normally appears on sectional charts as irregularly shaped areas outlined by *either blue or magenta hatched lines*. It is also identified by either a name, such as Tyndall E MOA, or an alphanumerical identifier like R-4404A. Hours of use and vertical limits of special use airspace areas, as well as the FAA facility controlling each area, are printed in one of the margins of the sectional chart. If the CAP crew has any doubt about entering special use airspace, it should contact the appropriate air traffic control facility first to check the status of the area in question.

Prohibited Areas contain airspace within which the flight of aircraft is prohibited for national security or other reasons. An example is the airspace around the White House.

An “R” prefix to a five-letter identifier indicates a *Restricted Area*. The Army may be conducting artillery firing within this airspace, or military aircraft may be practicing actual air-to-surface bombing, gunnery, or munitions testing. Shells, bombs, and bullets, as well as the dirt and fragments they throw into the air on ground impact, present a severe hazard to any aircraft that might come in their path. The restricted area’s boundaries are always printed in *blue*.

Within the boundaries of a *Military Operations Area* (MOA) the military may be conducting high-speed jet combat training or practicing air-to-ground weapons attack, without objects actually being released from the aircraft. MOA boundaries and their names are always printed in *magenta* on the sectional chart. Civilian aircraft operating under VFR are *not* prohibited from entering an active MOA, and may do so at any time without any coordination whatsoever (although this is considered foolish by many pilots). As stated earlier, since the FAA retains control of the airspace, it is prudent to contact the controlling air traffic facility before continuing a search into any MOA. Military aircraft, often flying at very low altitudes and at high speeds, are usually not in radar or radio contact with the air traffic controller (nor can they see or hear you). A controller can only provide positive separation to civilian IFR aircraft from the MOA boundary, *not* from the military aircraft itself. This may force significant maneuvering off your intended course.

4. Military Training Routes. Although not classified by the FAA as special use airspace, military training routes (MTRs) are for military low-altitude high-speed training. MTRs are identified by one of two designations, depending upon the flight rules under which the military operates when working within that airspace. *Instrument Routes* (IR) and *Visual Routes* (VR) are identified on sectional aeronautical charts by medium-weight solid gray lines with an alphanumeric designation. 4-digit numbers identify MTRs flown at or below 1500 feet AGL; 3-digit numbers identify those flown above 1500 feet AGL.

Only route centerlines are printed on sectional charts, but each route includes a specified lateral distance to either side of the printed centerline and a specific altitude "block". Route widths vary, but can be determined for any individual route by requesting Department of Defense *Flight Information Publication AP-1B* at the Flight Service Station.

The letters *IR* (e.g., IR-120) indicate that military aircraft operate in that route according to IFR clearances issued by air traffic control. Other non-military VFR aircraft may enter the lateral or vertical boundaries of an active IR route without prior coordination, while aircraft operating IFR are kept out by air traffic control. Just as in the case of a MOA, air traffic control may not have radar and radio contact with the military aircraft using the route. Therefore, it is necessary to provide separation between other IFR aircraft and the route airspace regardless of where the military aircraft may be located along the route. This may force either a route or altitude change. You can request the status of IR routes from the controlling air traffic facility.

The letters *VR* (e.g., VR-1102) indicate that the military operates under VFR when operating within the lateral and vertical limits of that airspace. The see-and-avoid concept applies to *all* civilian and military aircraft operating there, and all crew members must be vigilant in visual lookout when within or near a VR training route. Many military missions go to and from visual training routes' start and exit points on IFR clearances, and the prudent crew can inquire about the status of the route with air traffic control when operating through or near a VR training route.

You can determine *scheduled* military activity for restricted areas, MOAs, and military training routes by checking *Notices to Airmen* (NOTAMS) at the Flight Service Station. However, checking with the air traffic control facilities is preferable, since it will reveal *actual*, "real time" activity versus *scheduled* activity. When flying through any special use airspace or training route, crewmembers should be alert and cautious at all times, because incorrect or incomplete coordination between the military and the FAA is the rule rather than the exception.

Additional Information

More detailed information on this topic and examples are available in Chapter 8 of the MART.

Evaluation Preparation

Setup: Provide the student a sectional chart(s) containing controlled airports and all forms of special use airspaces.

Brief Student: You are an Observer trainee asked to identify (sectional) and discuss operations near controlled airports and special use airspaces.

Evaluation

Performance measures	Results	
1. Identify (sectional) and discuss operations in and near, and identify on a sectional chart:		
a. Controlled airport.	P	F
b. Prohibited airspace.	P	F
c. Restricted airspace.	P	F
d. Military Operating Area.	P	F
e. Military Training Routes.	P	F

Student must receive a pass on all performance measures to qualify in this task. If the individual fails any measure, show what was done wrong and how to do it correctly.